WHAT IS CLAIMED IS:

1. A method for controlling a substrate temperature of a substrate during processing of the substrate at a process energy, by controlling a chuck temperature of a chuck on which the substrate resides during the processing, comprising:

circulating a thermal transfer media at a thermal transfer media temperature through the substrate chuck to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate,

sensing the chuck temperature from at least one chuck temperature sensing location at the chuck,

reporting the sensed chuck temperature to a controller, where the controller is operable to adjust the process energy and at least one of the thermal transfer media flow rate and the thermal transfer media temperature, and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to bring the sensed chuck temperature within the desired temperature range.

2. The method of claim 1 wherein the chuck temperature is sensed from three different locations at the chuck.

3. The method of claim 1 wherein the chuck temperature is sensed from locations within the chuck.

4. The method of claim 1 wherein the chuck temperature is sensed from locations on a surface of the chuck disposed adjacent the substrate.

5. The method of claim 1 wherein the desired temperature range is between about fifty centigrade and about five hundred centigrade.

6. The method of claim 1 wherein the controller first attempts to bring the sensed temperature within the desired temperature range by adjusting at least one of the thermal transfer media temperature and the thermal transfer media flow rate, and

when adjusting at least one of the thermal transfer media temperature and the thermal transfer media flow rate cannot bring the sensed temperature within the desired temperature range, then the controller controls the sensed temperature by additionally adjusting the process energy.

7. The method of claim 1 wherein the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range.

8. The method of claim 1 wherein the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to heat the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range.

9. An apparatus for controlling a substrate temperature of a substrate during processing of the substrate at a process energy, comprising:

a chuck temperature input for receiving temperature measurements from temperature sensors at a substrate chuck,

a temperature set point input for receiving temperature set points, the temperature set points defining a range of temperatures within which the apparatus maintains the substrate temperature,

a chuck temperature controller output for sending control signals operable to selectively increase and decrease the chuck temperature to a chuck temperature controller,

a process energy output for sending control signals operable to selectively increase and decrease the process energy during the processing of the substrate, and

a controller for,

comparing the temperature measurements received from the temperature sensors at the substrate chuck through the chuck temperature input

to the temperature set points received through the temperature set point input,

sending control signals through the chuck temperature controller output to the chuck temperature controller to selectively decrease the chuck temperature when the temperature measurements received from the temperature sensors at the substrate chuck are above the temperature set points, and

sending control signals through the process energy output to selectively decrease the process energy when the temperature measurements received from the temperature sensors at the substrate chuck are above the temperature set points.

10. The apparatus of claim 9, wherein the controller is further operable for:

sending control signals through the chuck temperature controller output to the chuck temperature controller to selectively increase the chuck temperature when the temperature measurements received from the temperature sensors at the substrate chuck are below the temperature set points, and

sending control signals through the process energy output to selectively increase the process energy when the temperature measurements received from the temperature sensors at the substrate chuck are below the temperature set points.

11. The apparatus of claim 9, wherein the controller first sends control signals through the chuck temperature controller output to control the chuck temperature, and only sends control signals through the process energy output when the chuck temperature cannot be sufficiently controlled by the chuck temperature controller.

12. The apparatus of claim 9, wherein the control signals sent by the controller through the chuck temperature controller output further comprise:

a thermal transfer media flow control signal for controlling a flow of a thermal transfer media through the chuck, and

a thermal transfer media temperature control signal for controlling the temperature of the thermal transfer media flowing through the chuck.

13. A chuck for controlling a substrate temperature of a substrate on the chuck during processing of the substrate at a process energy, the chuck comprising:

a chuck surface having a face and a back side, the face of the chuck surface for receiving the substrate adjacent the chuck, the chuck surface having a high thermal conduction zone and a low thermal conduction zone, where the high thermal conduction zone of the chuck surface has a high thermal conductivity and is disposed adjacent a portion of the substrate that receives a greater degree of the process energy during the processing, and the low thermal conduction zone of the chuck surface has a low thermal conductivity and is disposed adjacent a portion of the substrate that receives a lesser degree of the process energy during the processing, and

a heat sink disposed adjacent the back side of the chuck surface for removing thermal energy from the chuck surface.

14. The chuck of claim 13 wherein the chuck surface further comprises a ceramic material embedded with a filler material, where the ceramic material has a lower thermal conductivity than the filler material, and the filler material has a higher thermal conductivity than the ceramic material.

15. The chuck of claim 14 wherein the ceramic material further comprises at least one of aluminum oxide and silicon oxide.

16. The chuck of claim 14 wherein the filler material further comprises at least one of aluminum nitride, silicon carbide, beryllium oxide, and diamond.

17. The chuck of claim 14 wherein the high thermal conduction zone of the surface of the chuck has a higher ratio of filler material to ceramic material than the low thermal conduction zone of the surface of the chuck, and the low thermal conduction zone of the surface of the chuck has a lower ratio of filler material to

ceramic material than the high thermal conduction zone of the surface of the chuck.

18. The chuck of claim 13 wherein the surface of the chuck has at least one intermediate thermal conduction zone, where each of the intermediate thermal conduction zones has a thermal conductivity that is between the thermal conductivity of the high thermal conduction zone and the thermal conductivity of the low thermal conduction zone, and each of the intermediate thermal conduction zones has a different thermal conductivity.

19. The chuck of claim 13 wherein the high thermal conduction zone forms a circle in a center of the surface of the chuck and the low thermal conduction zone forms an annular ring around the high thermal conduction zone on the surface of the chuck.

20. The chuck of claim 13 wherein the heat sink further comprises a flow chamber for receiving a temperature controlled fluid from a temperature controlled recirculator.